REMARKS

Claims 1-20 remain pending in the present application.

Claims 1-5, and 9-10 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent No. 6,101,200 to Burbidge et al. ("Burbidge") and U.S. Patent No. 5,832,014 to Johnson ("Johnson").

The present invention is directed to a laser device which is driven (operated) by a gain current applied by a gain section of the laser device. (*See, e.g.*, p. 9, lns. 18-24; 10, lns. 11-12). A tuning section of the laser device is used to tweak the output power of the laser device to address additional operating parameters such as side mode suppression ratio (SMSR). (*See, e.g.*, p. 3, lns. 9-10). The laser device also includes a temperature loop which adjusts the temperature of the laser device in order to lock the output of the laser device at a stable wavelength (*see, e.g.*, p. 7, lns. 13-14), since the output wavelength may fluctuate slightly in response to the adjustments made to the gain current and the tuning currents. Using these three loops, a plurality of operating parameters can be efficiently controlled in a tunable laser device such as a distributed Bragg reflector laser device.

Claim 1 recites "using a first feedback loop to periodically adjust a characteristic of said laser device in response to a sensed wavelength; and using a second feedback loop to periodically adjust a current applied to said laser device in response to a sensed amplitude." In other words, it is not necessary to continuously adjust a tuning current applied to the laser device of the claimed invention. As disclosed, for example, on page 10, lines 1-7 of Applicants' specification, according to this aspect of the invention, it is only necessary to adjust the tuning current when the operating conditions have drifted away from the desired parameters.

The Office Action interprets the automatic temperature control (ATC) module 3 in Burbidge as corresponding to the claimed first feedback loop and the automatic power control (APC) module 2 in Burbidge as corresponding to the claimed second feedback loop. Column 5, lines 17-19 in Burbidge disclose that "[t]he APC module 2 responds to the power level signal by correcting the drive current of the laser 7." Column 5, lines 30-31 teaches that "[t]he APC module 2 continuously adjusts the laser current to lock the power at a desired level," since the laser current applied by the APC module is the current which drives (operates) the laser. From these passages, it is clear that the current applied to the laser device by Burbidge's APC module is the current which drives the laser device, and is adjusted continuously. As the current which drives the laser device, the "loop" constituted by Burbidge's APC module is more closely matched with the power control loop disclosed in this application, rather than the tuning loop. Since the current from the APC module is adjusted continuously, it is, by definition, not adjusted periodically as is the case with the second feedback loop recited in claim 1. Furthermore, Burbidge does not disclose any other feedback loop which may operate in the manner recited in Applicants' claims.

Combining the disclosure of Johnson with that of Burbidge does not remedy Burbidge's shortcomings in meeting the claimed invention. Johnson teaches a laser device which operates its feedback loop 22 based on spontaneous emission of the tuning section, which represents the active layer carrier density of the laser device, and thus, the output wavelength (col. 4, lns. 22-25; col. 4, ln. 66 – col. 5, ln. 10). Johnson fails to disclose feedback loops for adjusting a laser device characteristic in response to a sensed wavelength or for periodically adjusting a current applied to the laser device in response to a sensed amplitude, as recited in claim 1.

Since Burbidge and Johnson, either alone or in combination, fail to teach or suggest each and every feature of Applicants' invention as recited in claim 1, the

claimed invention cannot be rendered unpatenable by these cited references. Claims 2-5 and 9-10 each depend ultimately from claim 1. In addition to being patentable over Burbidge and Johnson for the same reasons attributable to claim 1, each recites additional features which further distinguish the invention over these references. In view of the foregoing, withdrawal of this rejection is respectfully requested.

Claims 6-8 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Burbidge and Johnson, and further in view of U.S. Patent No. 6,222,861 to Kuo et al. ("Kuo").

Claims 6-8 depend ultimately from claim 1, and as discussed above, are novel and non-obvious over Burbidge and Johnson for at least the same reasons that claim 1 is novel and non-obvious over the same.

The addition of Kuo to the combined disclosures of Burbidge and Johnson is still insufficient to render obvious the claimed invention. Kuo teaches a method and apparatus for controlling the wavelength of a laser, in which a portion of the modulated optical signal is split off from the modulator 114 output to be transmitted to a feedback loop which controls the wavelength of the laser 112. Kuo, like Fee and Johnson, fails to teach or suggest, *inter alia*, using a second feedback loop to adjust a current of the laser device in response to a sensed amplitude, much less one that does so periodically.

Since Burbidge, Johnson and Kuo do not teach or disclose, either alone or in combination, each and every feature of the invention as recited in the claims, Applicants courteously submit that this rejection should be withdrawn.

Claims 11-17 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent No. 6,359,918 to Bielas ("Bielas") and U.S. Patent No. 6,341,189 to Deacon ("Deacon").

Independent claim 11 is directed to a method of starting up an operation of a tunable light source, comprising the steps of "ramping a tuning current . . . through a predetermined range of current levels within an operating mode" and "generating [and storing] a data curve representing the relationship between the applied tuning current and the amplitude of a signal output from said tunable light source." Claim 11 further recites determining "an optimal tuning current for said tunable light source" by referencing the generated curve data and look-up data (representing mode-hopping values) stored in memory in the laser device.

Similarly, independent claim 15 recites "ramping a tuning current . . . through a predetermined range of current levels" and "generating a data curve representing the relationship between the applied tuning current and the amplitude of a signal output from said tunable light source," each performed first for a first wavelength, and then again for a second wavelength.

Bielas teaches starting up a laser device using a look-up table indicating the amount of current to be provided to a light source corresponding to an inputted temperature value of the light source. The Office Action acknowledges that Bielas fails to teach or suggest "providing data in a memory representative of mode-hopping values," but then looks to Deacon to supplement this element of the claimed invention missing from Bielas. Deacon, however, merely discloses, essentially, that it is desirable to avoid mode-hopping.

As discussed in the Response to Office Action filed on May 12, 2003, even assuming, *arguendo*, that storage of mode-hopping data in memory is known to be provided in look-up table form, and that there is motivation in the prior art to modify Bielas by replacing the original data stored in Bielas with mode-hopping data, operation of Bielas' method as thus modified would result in the application of drive current to

the laser device at precisely one of the unstable mode-hopping values. The proposed modification of Bielas would yield this result because in the claimed invention, the stored data corresponds to the points at which mode-hopping occurs, and the actual values of operation fall between the stored values and are therefore calculated based on the stored values. Bielas teaches merely to operate the disclosed apparatus according at one of the data points stored in the look-up table, without subsequent calculation. Thus, the proposed modification of Bielas results in the application of one of the stored mode-hopping current values to the laser device.

Furthermore, neither Bielas nor Deacon teaches or suggests anything close to the claimed process of ramping the tuning current through a predetermined range of values for a desired operating mode and/or wavelength, and then generating a data curve to represent the relationship between the tuning current and the amplitude of a signal output from the laser device, as recited in claims 11 and 15. In Biealas, the disclosed look-up table is programmed into the memory prior to any operation of the laser device. In the claimed invention, in addition to having the look-up table previously stored into memory, the laser device actively generates a data curve corresponding to a desired operating mode/wavelength during a startup operation of the laser device.

In light of the significant differences between the invention recited in independent claims 11 and 15 and the disclosures of Bielas and/or Deacon, Applicants respectfully submit that claims 11 and 15 are patentably distinguishable over the cited references. Claims 12-14 and 16-17 depend ultimately from independent claims 11 and 15, and as such, incorporate the features recited in their respective base claims, and further recite additional subject matter which, in combination with the latter, are not taught or disclosed in Bielas and/or Deacon. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 18 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Bielas and Deacon, and further in view of Johnson.

Claim 18 depends from independent claim 15, which was demonstrated above to be novel and non-obvious over the combination of Bielas and/or Deacon. The addition of Johnson to this combination does not supplement the disclosures of Bielas and Deacon to render obvious the claimed invention, because Johnson also lacks any mention of stored look-up data in a memory, much less actively generating a data curve for the desired operating mode or wavelength during any particular stage of operation of the laser device. Absent any disclosure of these features, *inter alia*, it is impossible to render obvious the invention recited in claim 18 (and claim 15) based on the combined disclosures of Bielas, Deacon, and/or Johnson. Thus, withdrawal of this rejection is courteously requested.

Claim 19 has been rejected under 35 U.S.C. 102(e) as being anticipated by Burbidge.

Claim 19 is an independent claim and recites three parameters which are adjusted during operation of the laser device, *i.e.*, a gain current in response to signals output at the backface of the laser device, a tuning current in response to output power of the laser device, and a wavelength characteristic in response to an optically filtered transmission fraction of the output power.

Burbidge only teaches adjusting two parameters to maintain stable operation of the laser device, *i.e.*, the drive current in response to output power and the temperature of the laser device in response to a wavelength error signal. As discussed above, the drive current in Burbidge most closely corresponds to Applicants' gain current recited in the claims. Burbidge is entirely silent as to the use of a third feedback

loop to adjust a tuning current, which is different from the current which drives the laser device. Since Burbidge does not teach each and every feature of the claimed invention, Applicants' claim 19 cannot be anticipated by Burbidge. Withdrawal of this rejection is therefore respectfully requested.

Claim 20 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Burbidge and U.S. Patent No. 6.233,262 to Mesh.

Claim 20 depends from claim 19 and therefore incorporates the features recited in the latter which distinguish the invention over Burbidge, and further recites additional subject matter which, in combination with the features recited in claim 19, are not taught in Burbidge.

Mesh is relied upon for its teaching of a microprocessor used for controlling the disclosed laser device. Assuming, *arguendo*, that a suggestion and motivation to substitute Mesh's microprocessor for various control-type elements of Burbidge (the Office Action does not specify how the modification is proposed to be achieved), can be found in the disclosures of either Burbidge and/or Mesh, the cited combination still fails to disclose a method of stabilizing the operation of a laser device by adjusting a gain current, a tuning current, and a wavelength characteristic of the laser device as recited in claim 19, from which claim 20 depends. Thus, Applicants respectfully submit that this rejection should be withdrawn.

For each of the reasons presented above, Applicants believe that each of the presently pending claims in this application is in immediate condition for allowance. According, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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